

REMARKS

Claims 1 - 18 are presently pending. In the above-identified Office Action, the Examiner provisionally rejected Claims 1, 3 - 9, 14, 17 and 18 under the judicially created doctrine of obviousness-type double patenting over Claims 1 - 8, 10, 14 and 20 of copending Application No. 09/797,220. Claims 1, 9 - 11, 14 - 16 and 18 were rejected under 35 U.S.C. § 102(b) as being anticipated by Paranto *et al.* (US Patent No. 5,621,514), hereinafter 'Paranto'. Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Paranto in view of Gross (US Patent No. 4,687,281). Claims 4 - 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Paranto in view of Rice *et al.* (US Patent No. 6,061,170). Claims 3 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Paranto in view of Kafka *et al.* (US Patent No. 6,421,573). Claims 3 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Paranto in view of Coppock *et al.* (US Patent No. 4,339,821). Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Paranto in view of Phillips *et al.* (US Patent No. 5,835,199). Claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Paranto in view of Pearson (US Patent No. 4,516,853). Claim 17 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Paranto in view of Low *et al.* (US Patent No. 3,737,231).

By this Paper, Applicant proposes amendments to Claims 1, 17 and 18 to highlight the patentably distinct features thereof. Claim 2 has been amended to eliminate redundancy therein due to the amendment to Claim 1. For the reasons set forth more fully below, reconsideration, allowance and passage to issue are respectfully requested.

As to the provisional double patenting rejection, Applicant provides herewith a terminal disclaimer with respect to copending Application No. 09/797,220. The disclaimer confirms that the present application and the copending application are commonly owned.

The present invention addresses the need in the art for a laser transmitter capable of producing the coherence, high power, and high bandwidth required for use in synthetic

aperture ladar applications. In accordance with the invention, a synthetic aperture ladar system is taught including a mode locked synthetic aperture laser transmitter; a synthetic aperture receiver adapted to detect signals transmitted by said laser and reflected by an object and a signal processor for analyzing the signals.

The laser is particularly novel as a synthetic aperture ladar transmitter inasmuch as it includes a mode locking mechanism. Unlike the single mode laser transmitters that typify the prior art, the mode locking mechanism of the present invention causes the laser to output energy at all modes within the gain profile in phase with one another. The result is a series of coherent pulses which may be used for synthetic aperture ladar applications.

In a particular embodiment, the laser is an erbium or erbium, ytterbium-doped, fiber pumped laser and the mode locking mechanism is a passive quantum well absorber crystal or an active acoustic crystal mounted in the laser cavity. In any event, the return signals are received and processed to extract range and cross-range imaging information. To this end, the signal processor includes a range de-multiplexer for organizing the return signals into range bins. For each range bin, the signal processor applies a Fast Fourier Transform and centroid detection algorithm to extract a signal representing Doppler frequencies for each range bin. In addition, the signal processor may also extract a signal representing intensity for each range bin.

The invention is set forth in claims of varying scope of which Claim 1, as amended, is illustrative. Claim 1 recites:

1. A ladar system comprising:
a mode locked synthetic aperture laser transmitter;
a receiver adapted to detect signals transmitted by the
laser and reflected by an object and
a signal processor for analyzing the signals. (Emphasis
added.)

None of the references, teach, disclose or suggest the invention as presently claimed. That is, none of the references, taken alone or in combination, teach, disclose or suggest a ladar system comprising a **mode locked synthetic aperture** laser transmitter, a receiver and a signal processor as presently claimed.

In the rejection of Claim 2, the Examiner acknowledged, *inter alia*, that Paranto does not teach that the system is a synthetic aperture ladar system. Accordingly, the Examiner suggested that this shortcoming is overcome by the teaching of Gross. However, Applicant respectfully counters that this position is in error.

Gross purports to teach a synthetic aperture laser radar system.. The Examiner suggests that it would have been obvious to combine the mode locked laser of Paranto with the synthetic aperture ladar of Gross. However, this is a *non sequitur*. As set forth at page 8, lines 26 - 28 of the Specification:

“The mode locked waveform hasn’t been suggested in the past for synthetic aperture ladar because people do not think of it as a coherent waveform due to the small pulselets that constitute it.”

Accordingly, Applicant respectfully submits that the Examiner’s assertion that it would have been obvious to one of ordinary skill in the art to use a synthetic aperture ladar system as taught by Gross in the system of Paranto to provide accurate long-range ladar for high-resolution satellite imagery is in error due to the small pulselets associated with mode locked waveforms.

Inasmuch as all of the claims currently include limitations drawn to the use of a mode locked synthetic aperture ladar transmitter, all of the claims should be allowable. Reconsideration, allowance and passage to issue are therefore respectfully requested.

Respectfully submitted,
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